

## Micromachined Sensors for Hypersonic Flows, Phase I

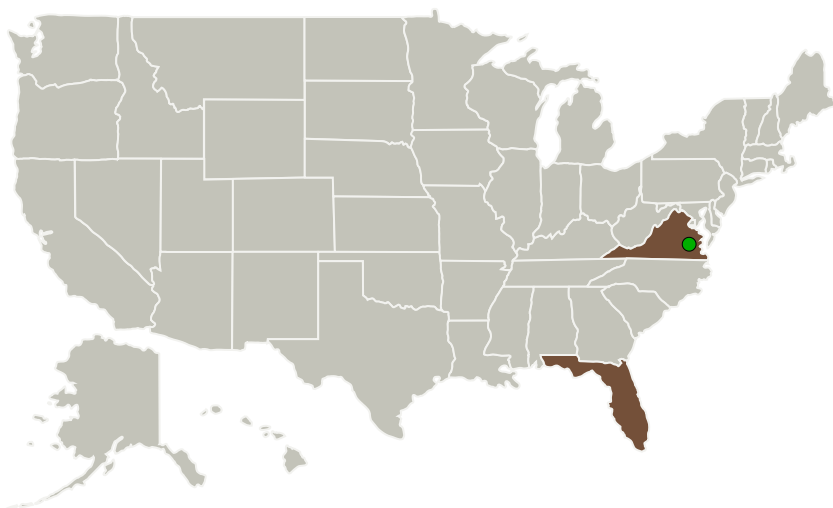
Completed Technology Project (2011 - 2011)



## Project Introduction

Interdisciplinary Consulting Corporation proposes a sensor that offers the unique capability to make wall shear stress measurement and pressure measurements for time resolved, unsteady hypersonic measurements in NASA facilities. An all sapphire optical-based sensor scheme will facilitate high bandwidth, high resolution, and robust sensors for both skin friction and pressure measurements in harsh hypersonic flow environment. The proposed shear stress sensor possesses utilizes Moire based technique for non intrusive remote data acquisition using sapphire fibres. The pressure sensor utilizes an optic lever-based measurement scheme. Both the shear and pressure sensor are co-located on a single die for localized surface stress measurement. A robust and compact package with miniature interface electronics enables flush sensor mounting conformal with the surface. The sensor development effort focuses on novel pico-second laser micromachining techniques for fabrication on sapphire with minimal heat damage to maintain original sensor material properties. Furthermore, sapphire's high transparency (170 nm to 5.3  $\mu\text{m}$  wavelength range) along with the availability of sapphire optical fibers make possible the fabrication of optical sensors with the electronics located remotely from the sensor. Sapphire wafers are also readily available in numerous sizes and crystallographic orientations. The sensor will exceed its predecessors in performance and will offer hypersonic surface stress measurement capabilities that are currently insufficient.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Interdisciplinary Consulting Corporation	Lead Organization	Industry	Gainesville, Florida
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Florida	Virginia

## Project Transitions

**February 2011:** Project Start**September 2011:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/138302>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Interdisciplinary Consulting Corporation

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

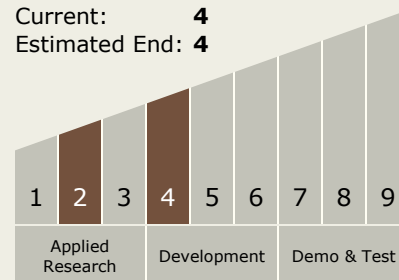
Benjamin Griffin

## Technology Maturity (TRL)

Start: 2

Current: 4

Estimated End: 4



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## Technology Areas

### Primary:

- TX15 Flight Vehicle Systems
  - └ TX15.1 Aerosciences
    - └ TX15.1.1 Aerodynamics

## Target Destinations

The Sun, Earth, The Moon,  
Mars, Others Inside the Solar  
System, Outside the Solar  
System